

Shades of Green

KDHE Environmental Conference
Capital Plaza/Manor Conference Center
Topeka, Kansas
April 14, 2011

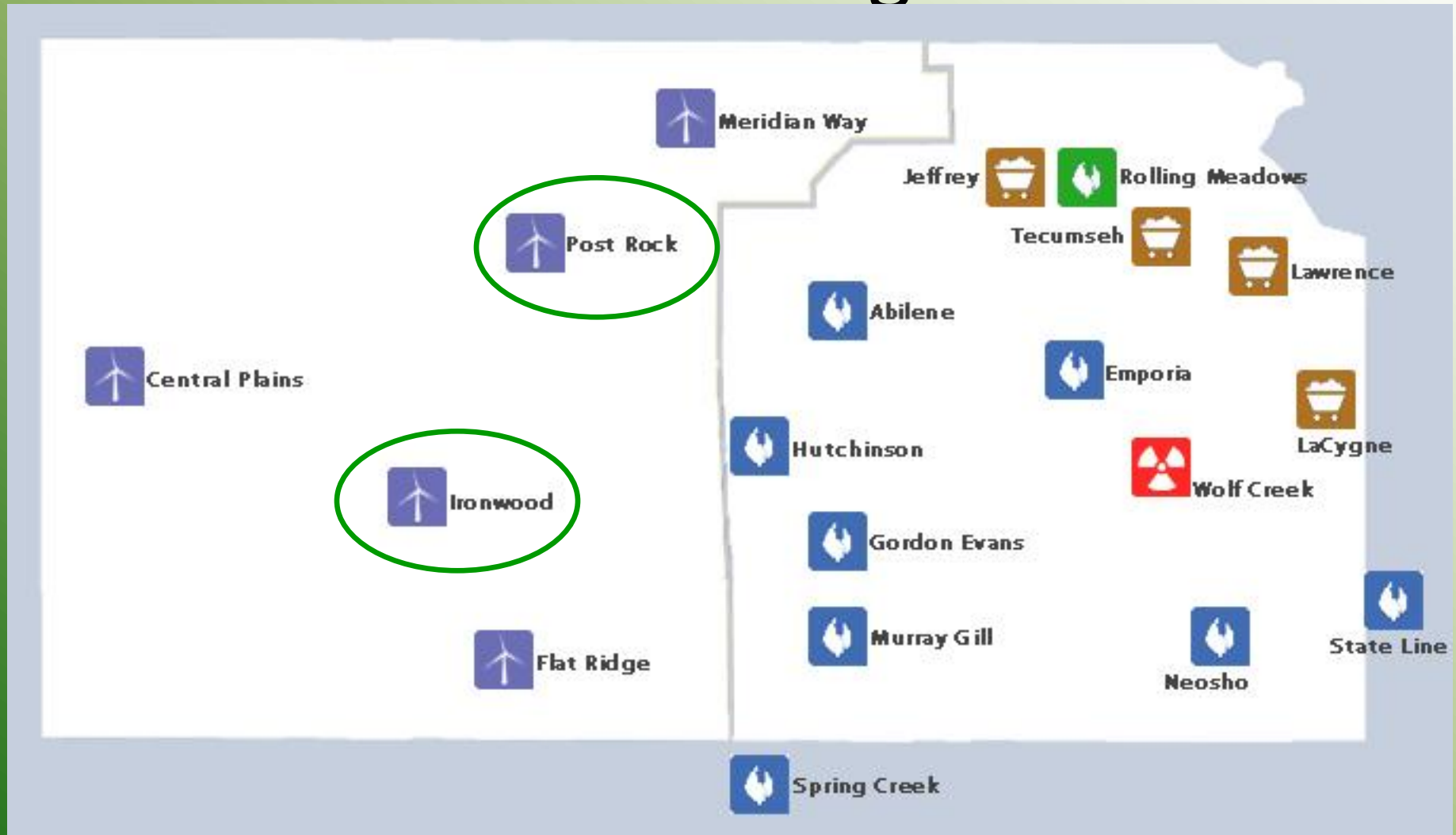
Bill Eastman
Director, Environmental Services
bill.eastman@westarenergy.com

Kansas' Largest Electric Provider



- Pure-play, vertically integrated, rate-regulated
 - 7,000 MW of generation
 - 6,200 miles transmission
 - 687,000 customers

Westar's Generating Resources

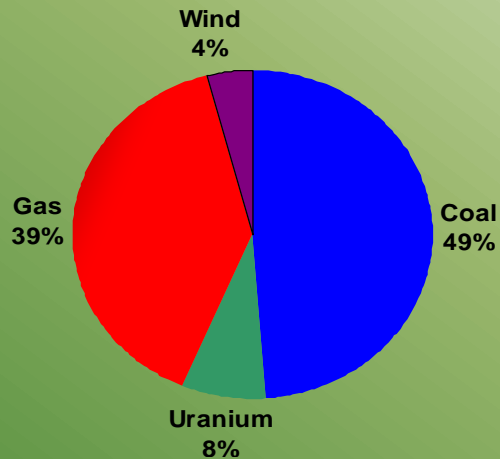


○ Indicates proposed facility

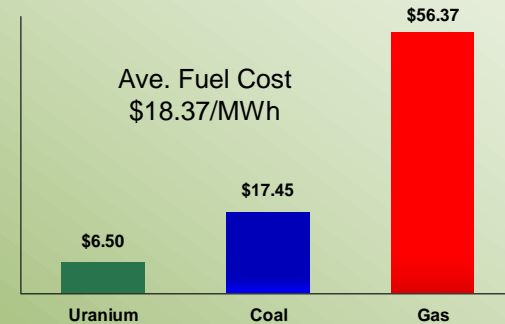
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Favorable Supply Portfolio

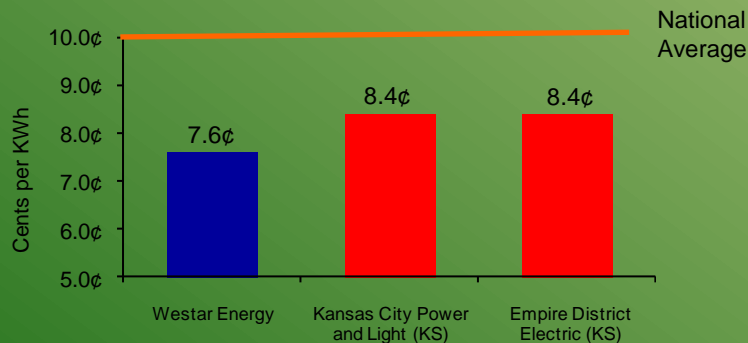
MW Capacity



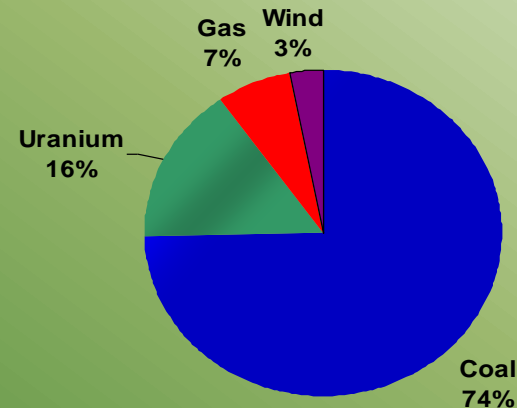
Cost of Fuel



Low Rates

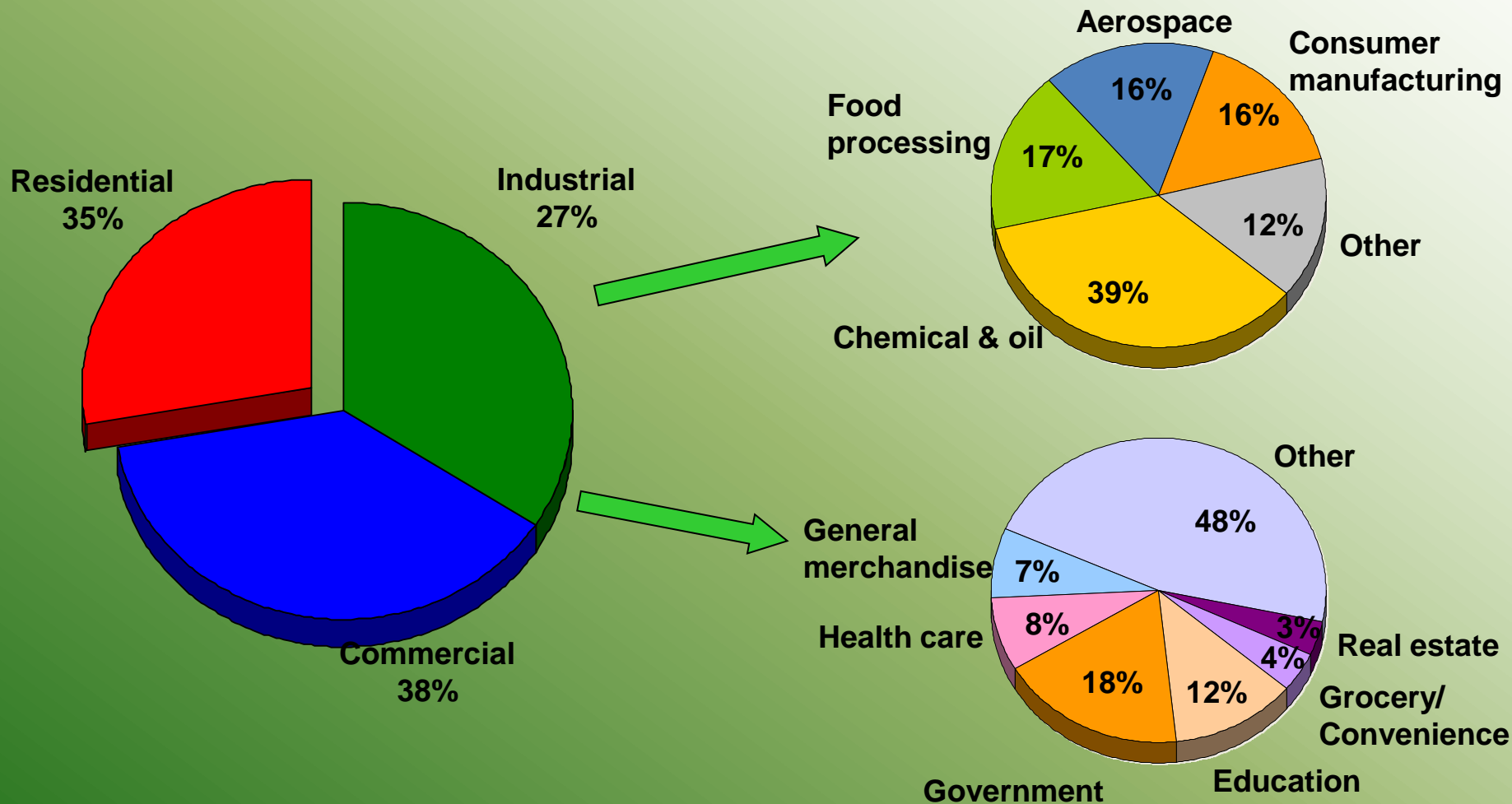


Fuel Mix



Source: Edison Electric Institute 07/01/2010

Diverse Energy Sales (MWh)

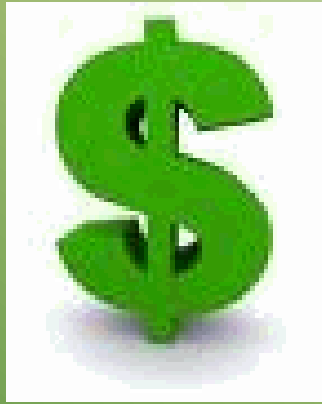




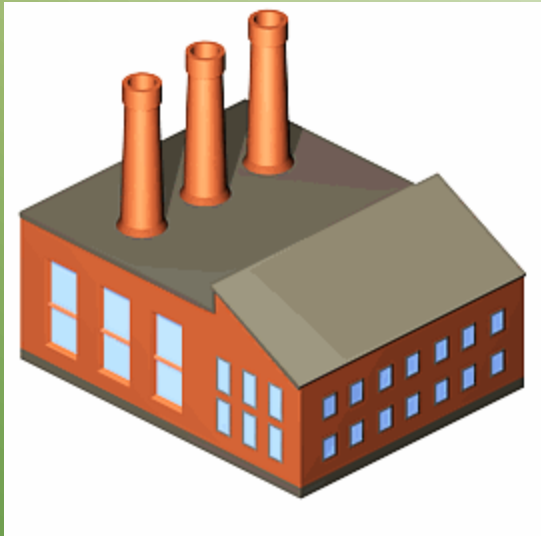
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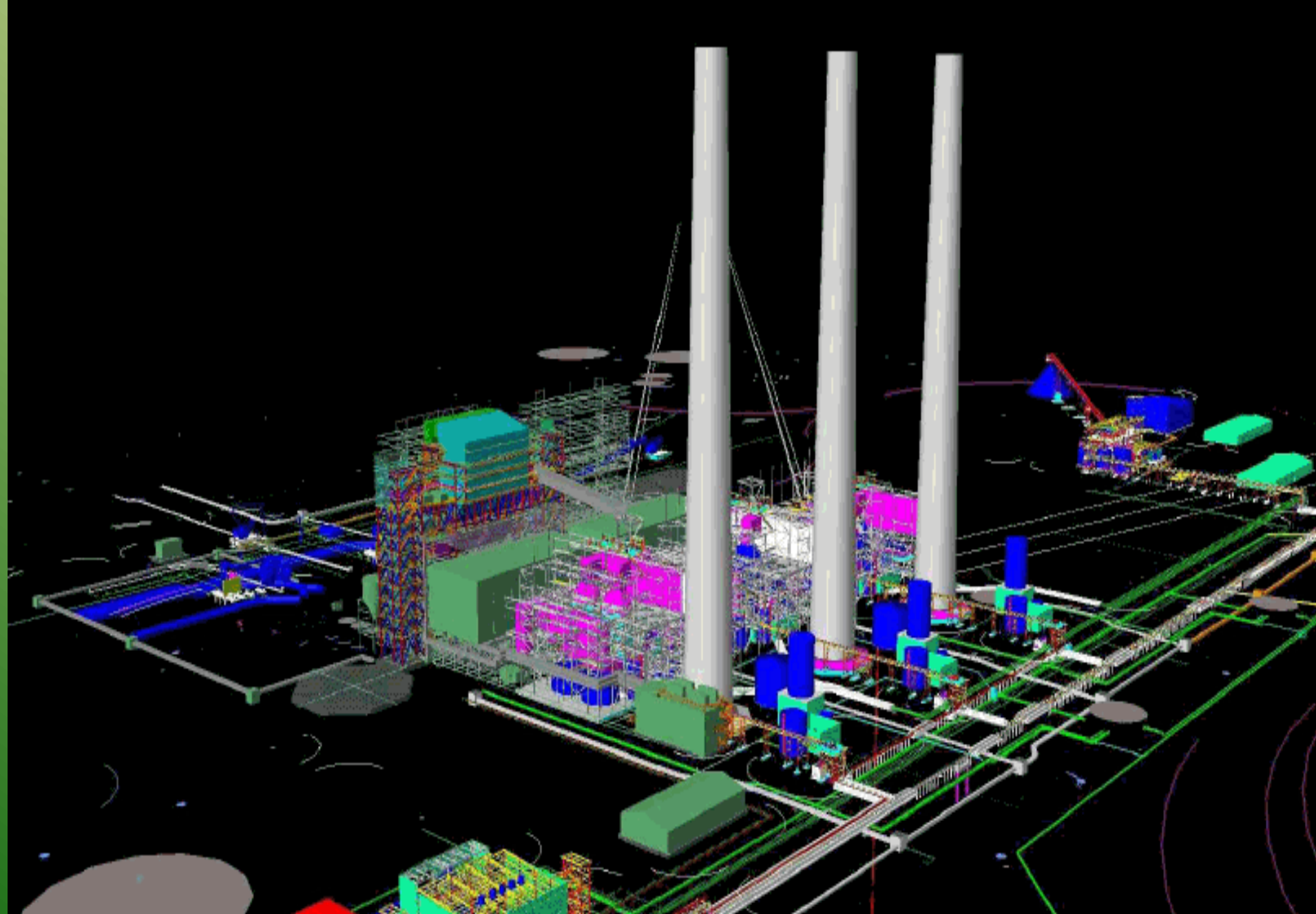


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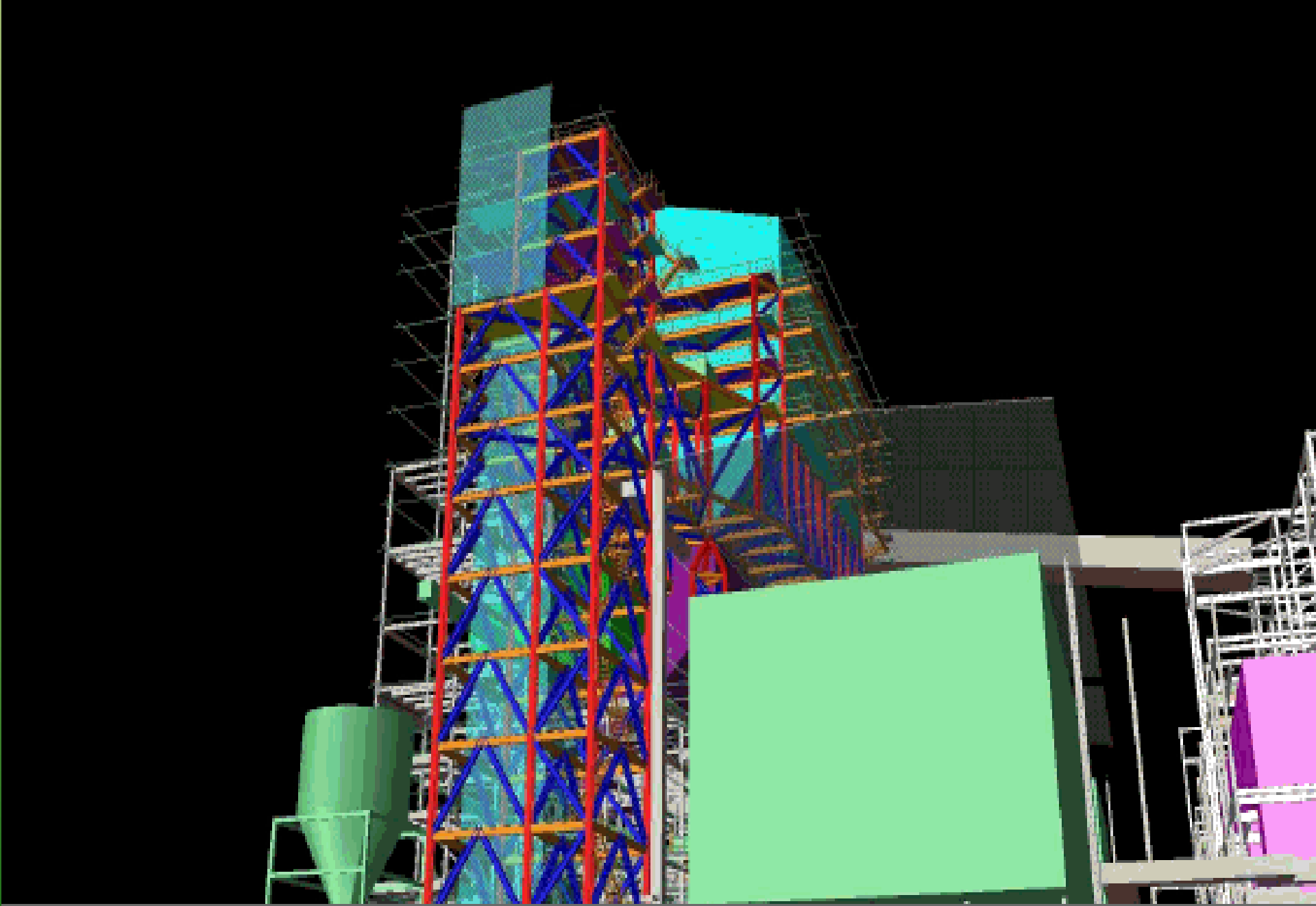


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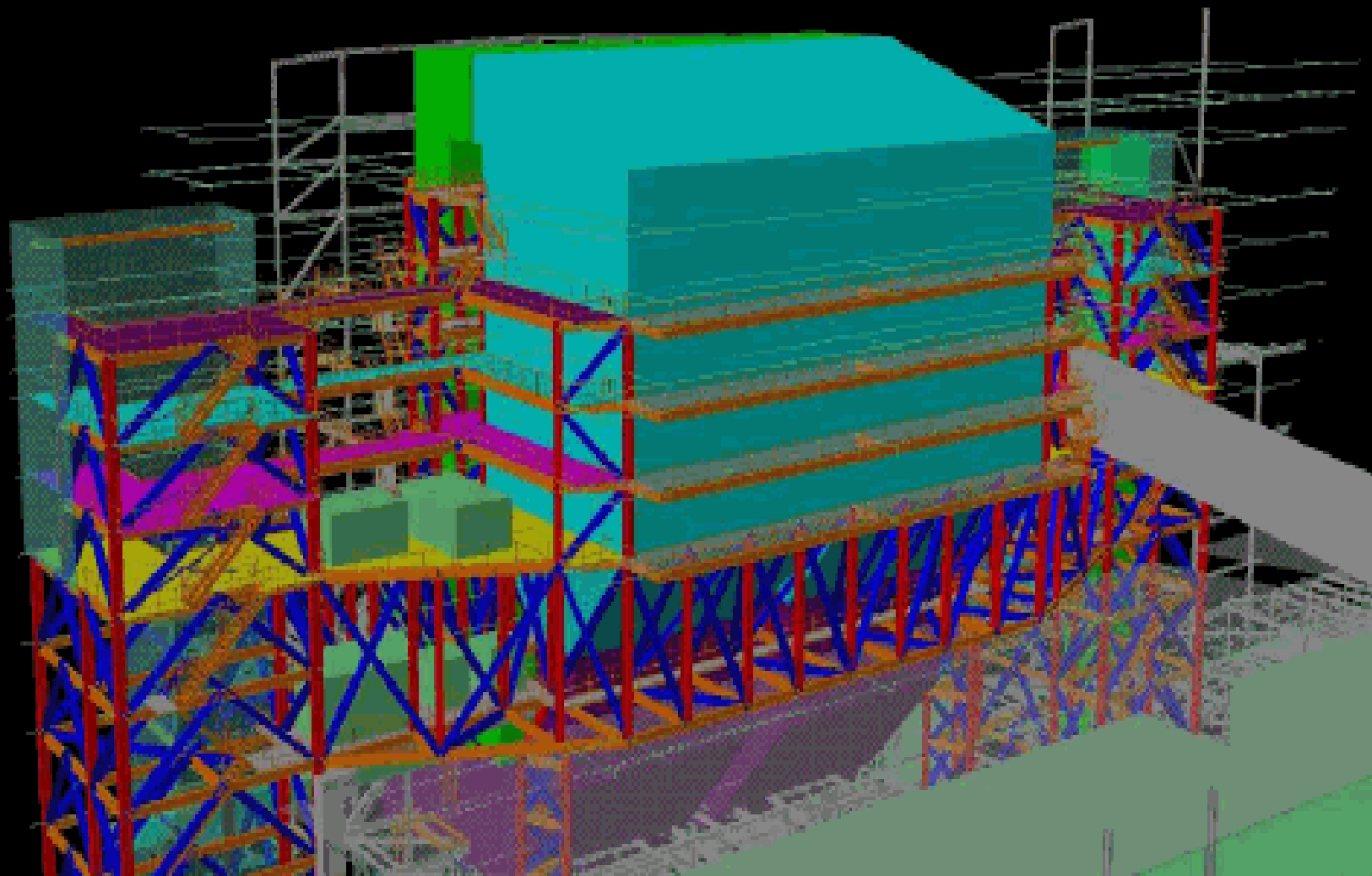
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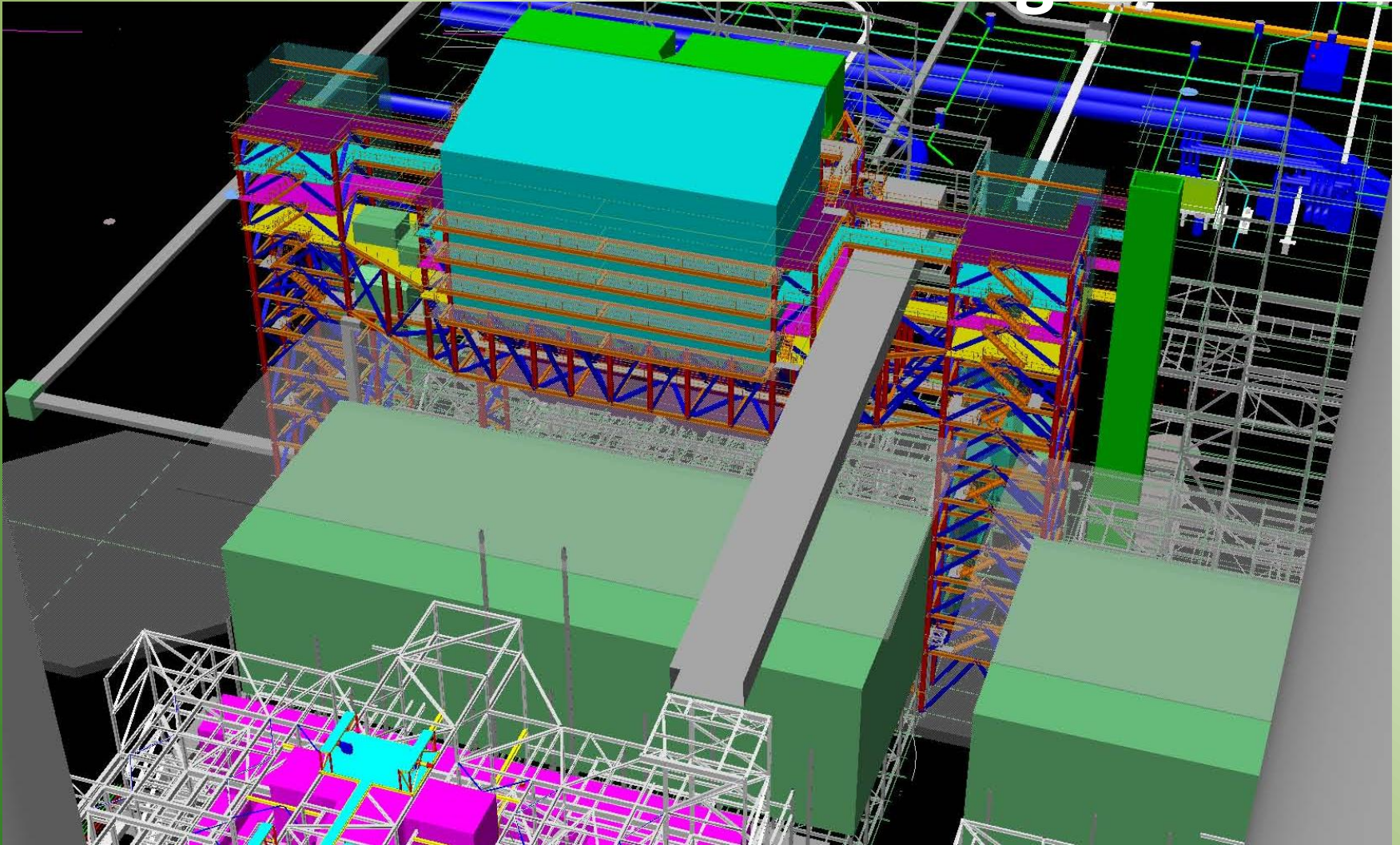
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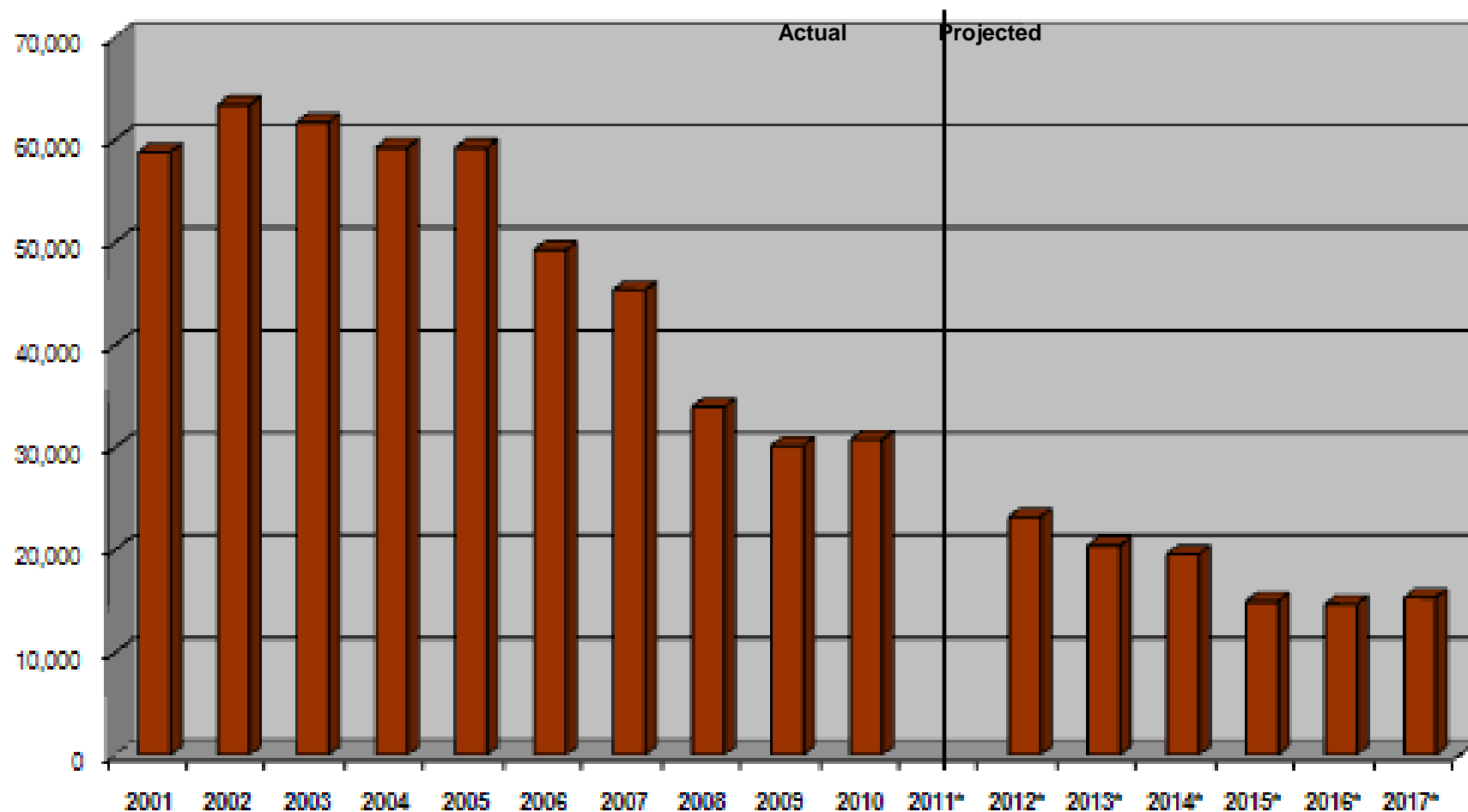


Elevation Looking South



Nitrogen Oxide ↓ 48%

(tons)



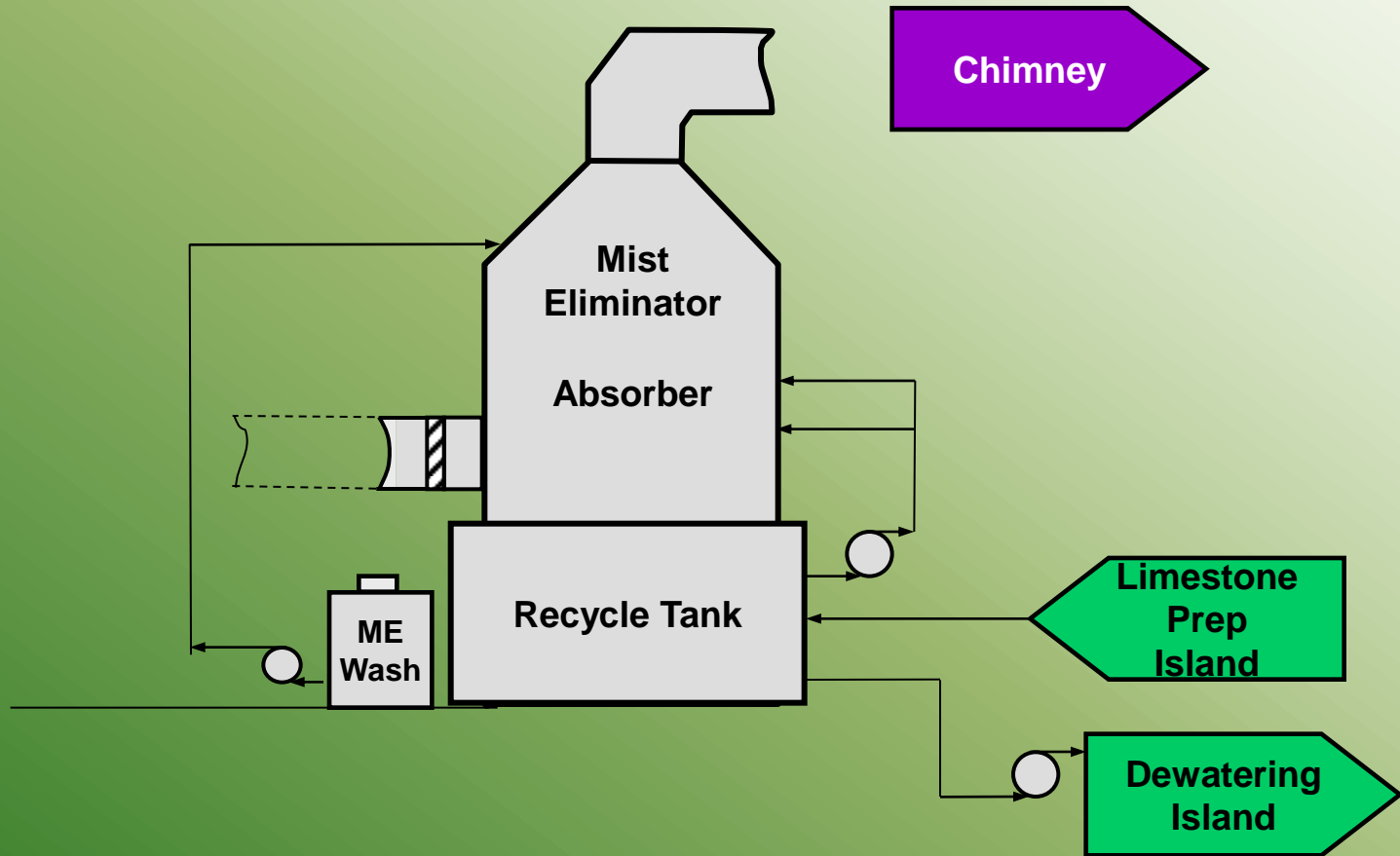


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How a Scrubber Works



New Outlet Ductwork Installation Unit 1



Dewatering Building Construction

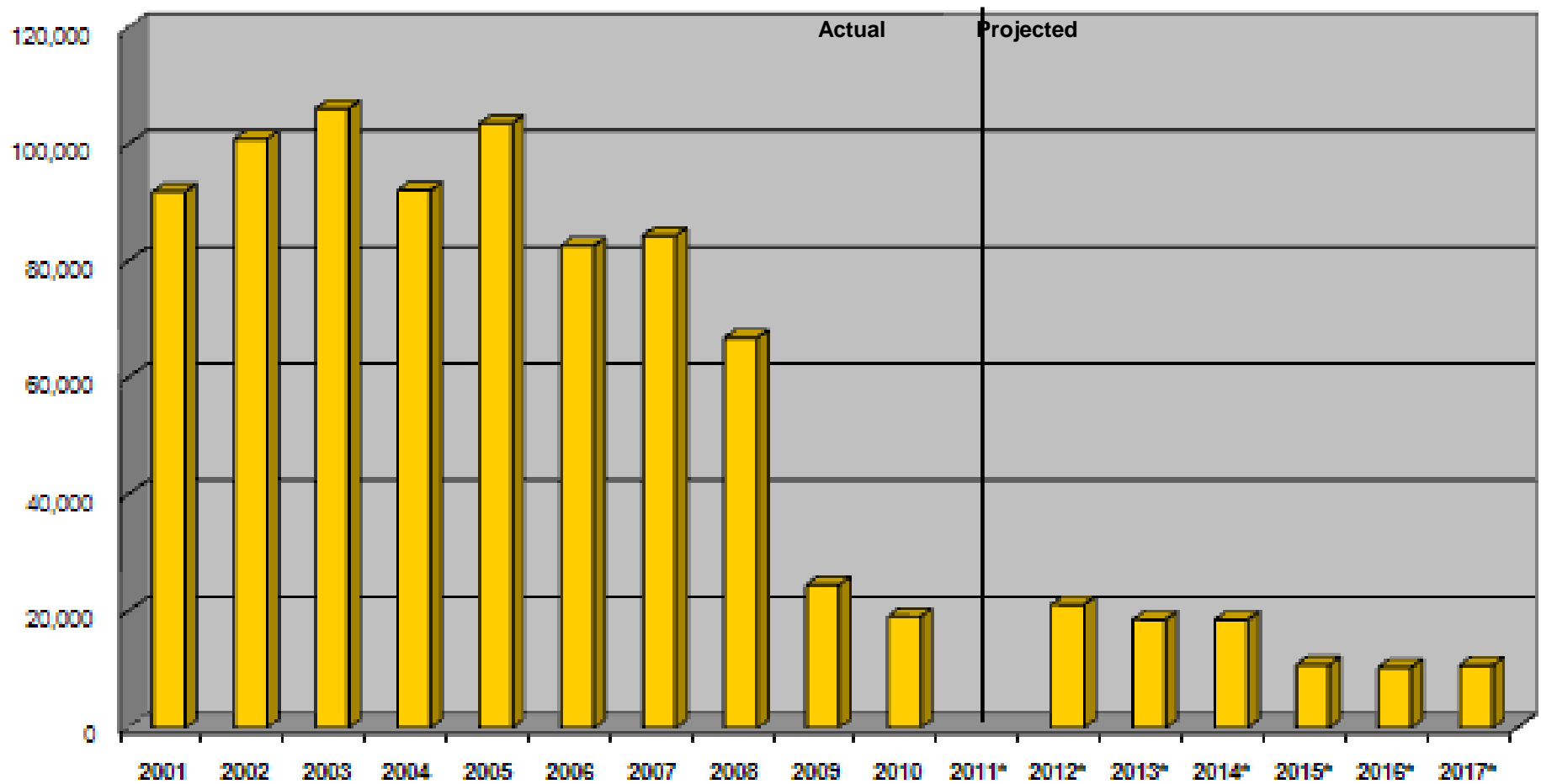


Dewatering Building 3rd Level



Sulfur Dioxide ↓ 82%

(tons)



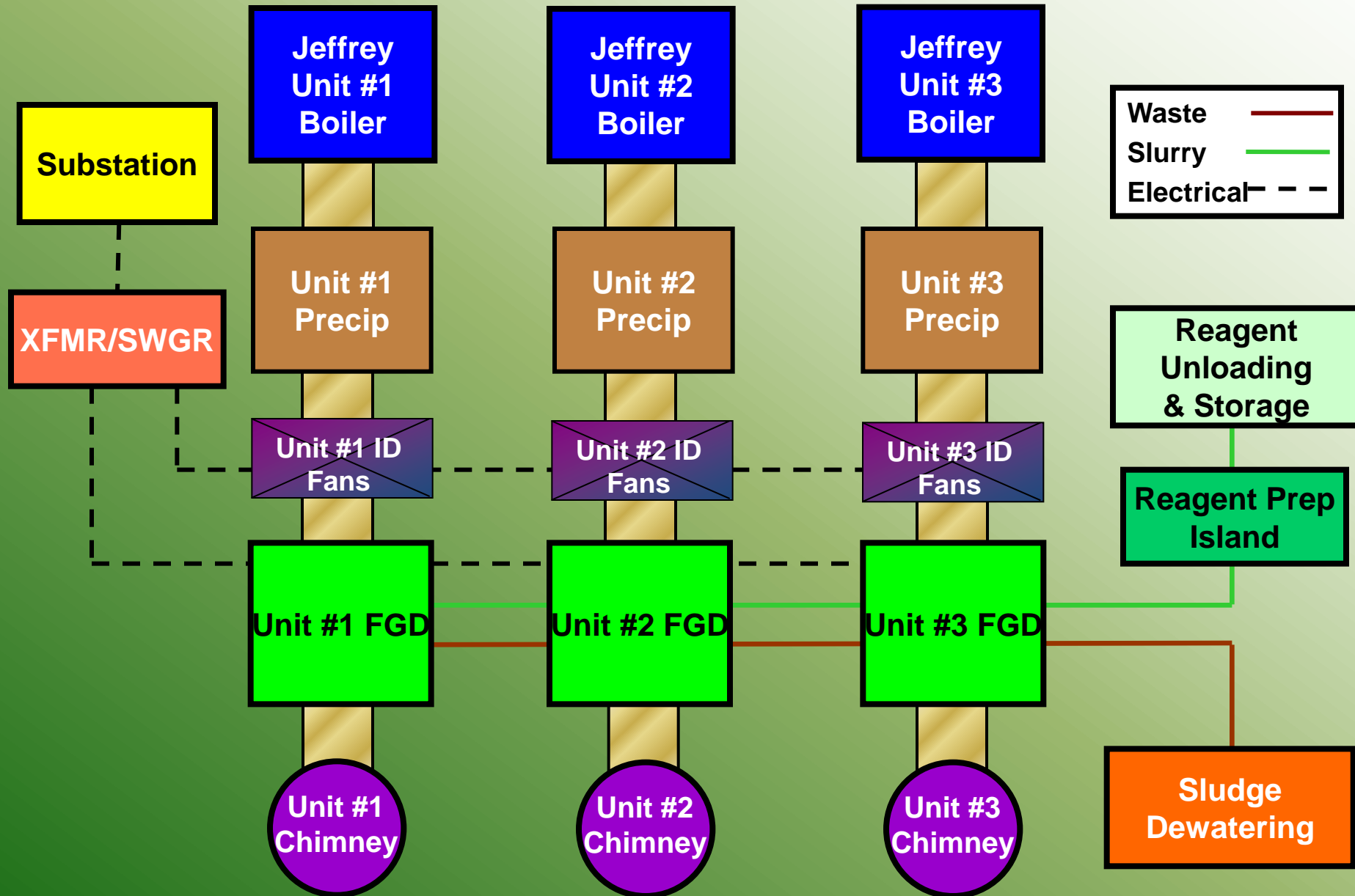


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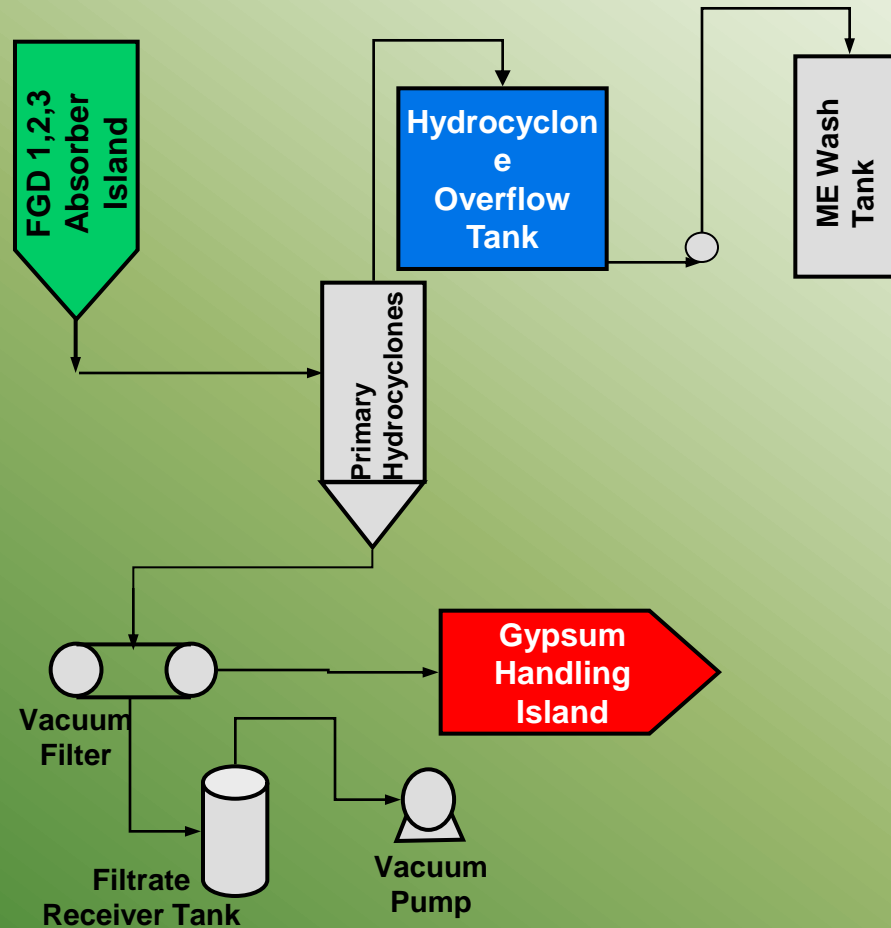
JEC Air Pollution Control Schematic



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Dewatering System

Gypsum Production



Our Challenges



A satellite map of a landscape with various green and brown patches, representing vegetation and land use. A blue callout arrow originates from a star on the right side of the map and points towards the left, where a table is located.

Chloride	550 mg/L
Sulfate	2,360 mg/L
Selenium	0.100 mg/L
Boron	3.40 mg/L
Fluoride	12.6 mg/L

Temperature

–

**Considering
Waste Heat
Potential**

-  Irrigated Tree Farm
-  Irrigated Prairie



Pilot Wetland



Full Scale Wetland

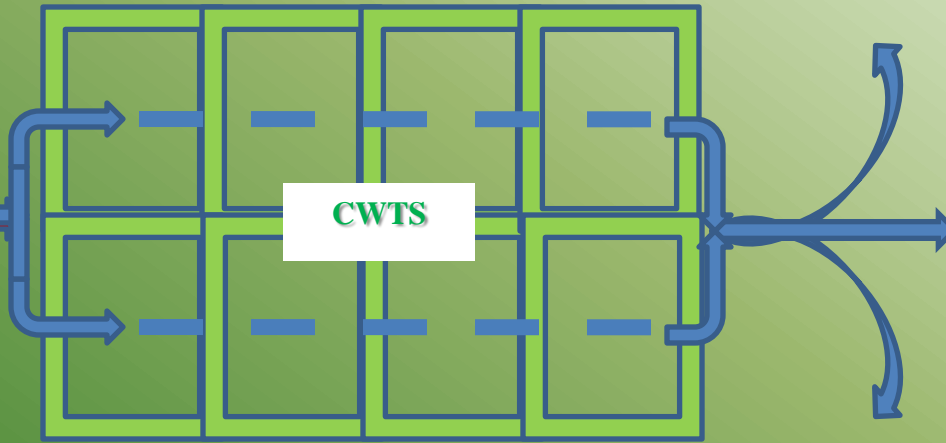


Constructed Wetland

Lake Water

CWTS

FGD WW





Vegetated
Submerged
Bed Cells



Vertical Flow Bed Cells



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Beemat Floating Wetlands



Deep Cell Wetland Plugs



Constructed Wetland Pilot

- Treating 7% of FGD wastewater
- 18,000 GPD Raw Water
- ~ 7 Day Residence Time
- Chemical Feed Ability - All Cells
- ~ 2 Acres in Size
- Wetland Media Will be Removed/Replaced

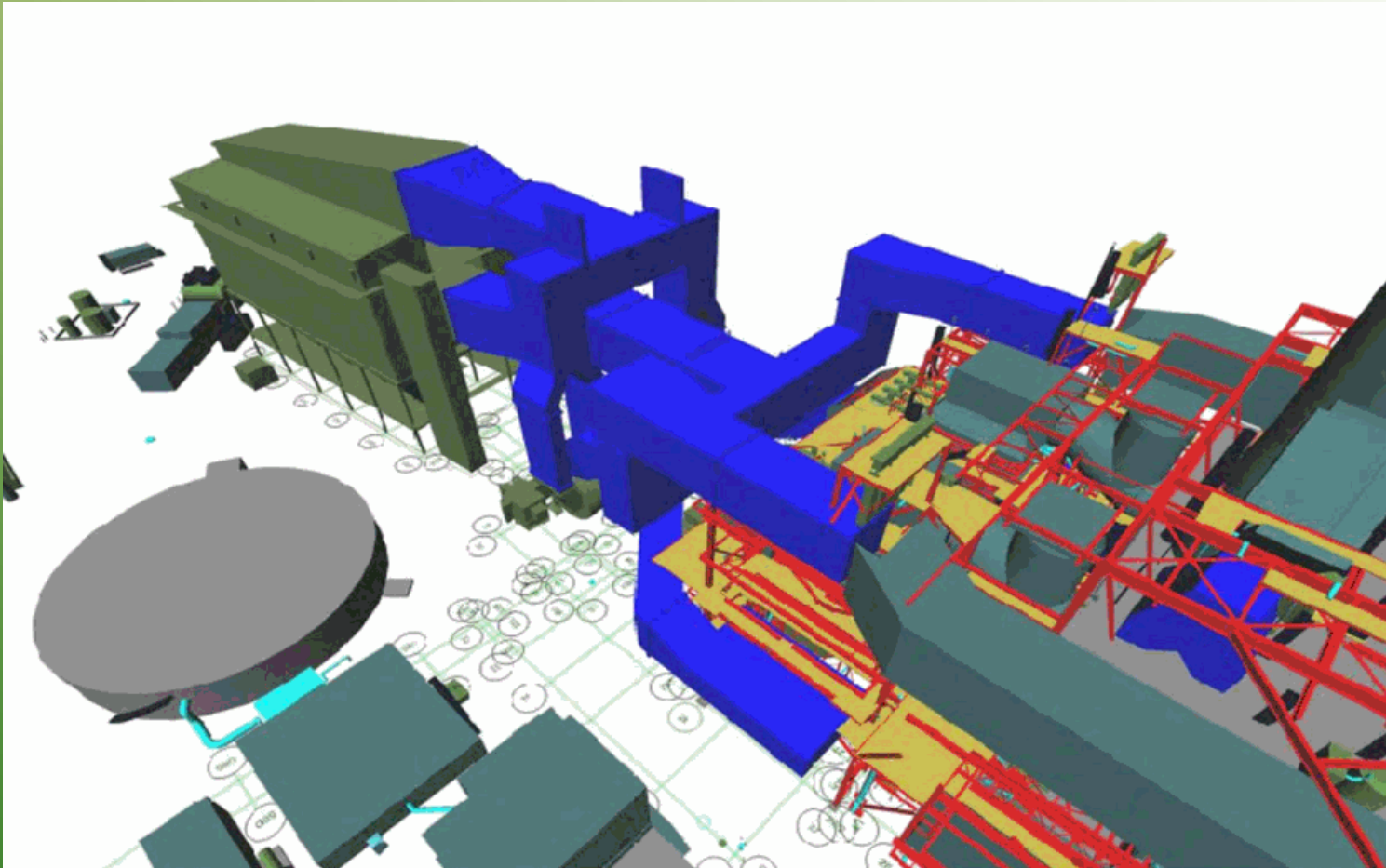


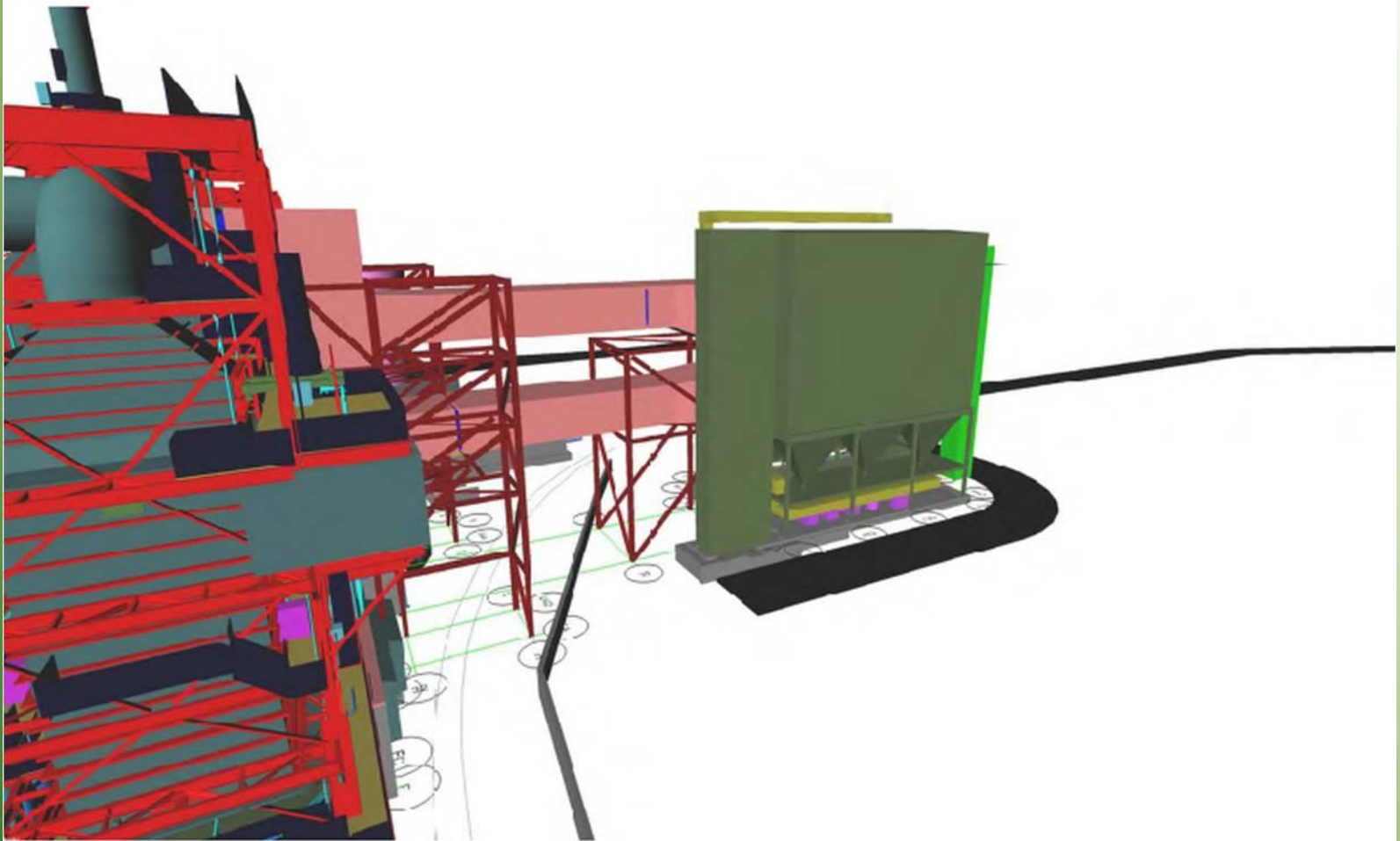


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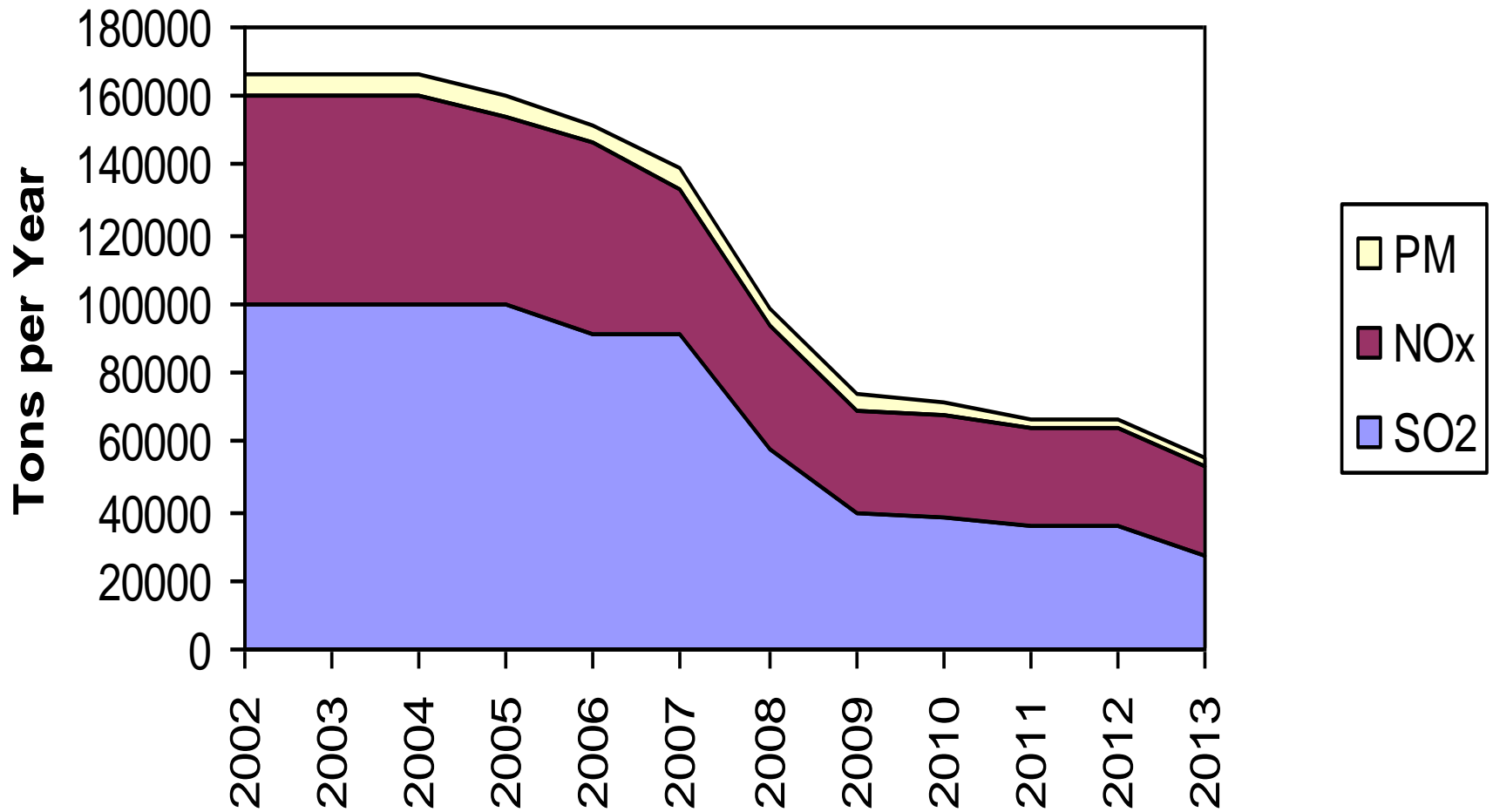
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Westar Emission Reductions

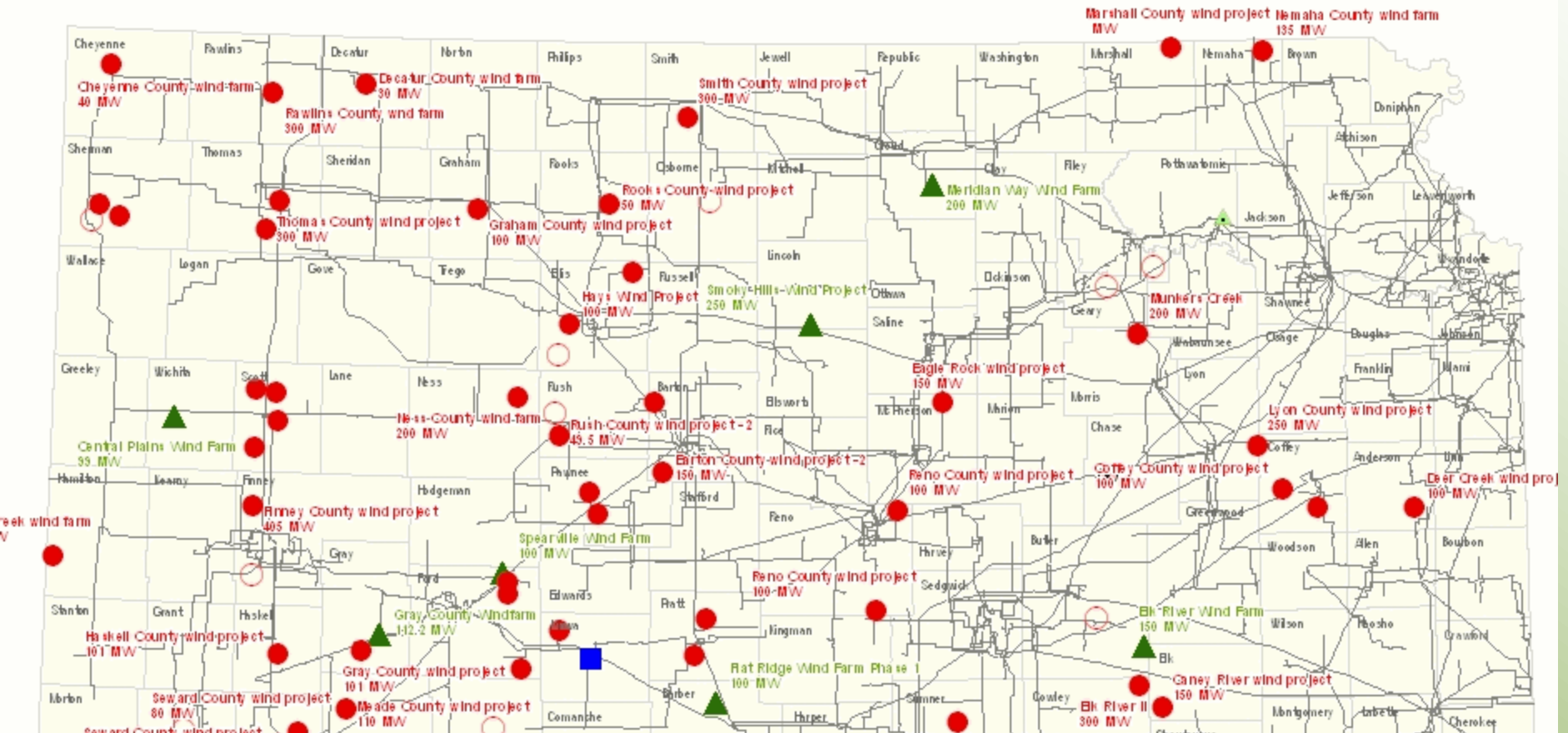




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Proposed and Existing Wind Projects in Kansas

January 2010



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Westar's Generating Resources



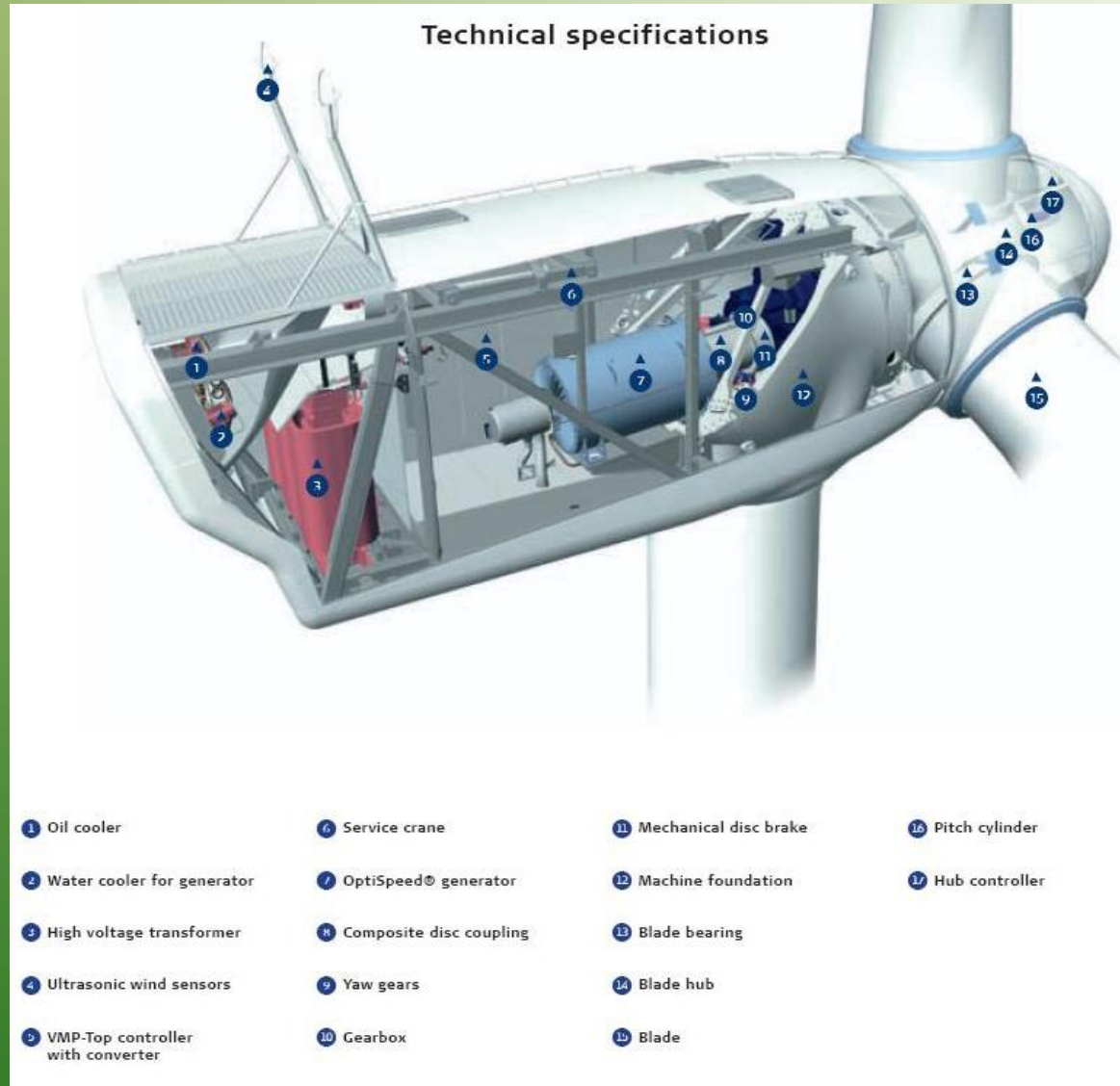
○ Indicates proposed facility

Vestas V-90 Wind Turbine Generator

- Hub Height: 262'
- Rotor Diameter: 295'
- Blade Length: 144'-4.5"
- Tower Weight: 176 ton
- Tower Diameter: Base, Top: 11'-11.7", 7'-6.6"
- Cut in wind speed: 7.8 MPH
- Cut out wind speed: 56 MPH
- Design wind speed: 22.4 MPH
- Extreme wind speed (10 min. avg.): 112 MPH
- Survival wind speed (3 sec. gust): 156 MPH
- Design rotor speed: 16.1 RPM
- Operational rotor speed: 8.6 – 18.4 RPM
- Generator rated speed: 1755 RPM



Vestas V-90 Wind Turbine Generator



Vestas V-90

Power Curve

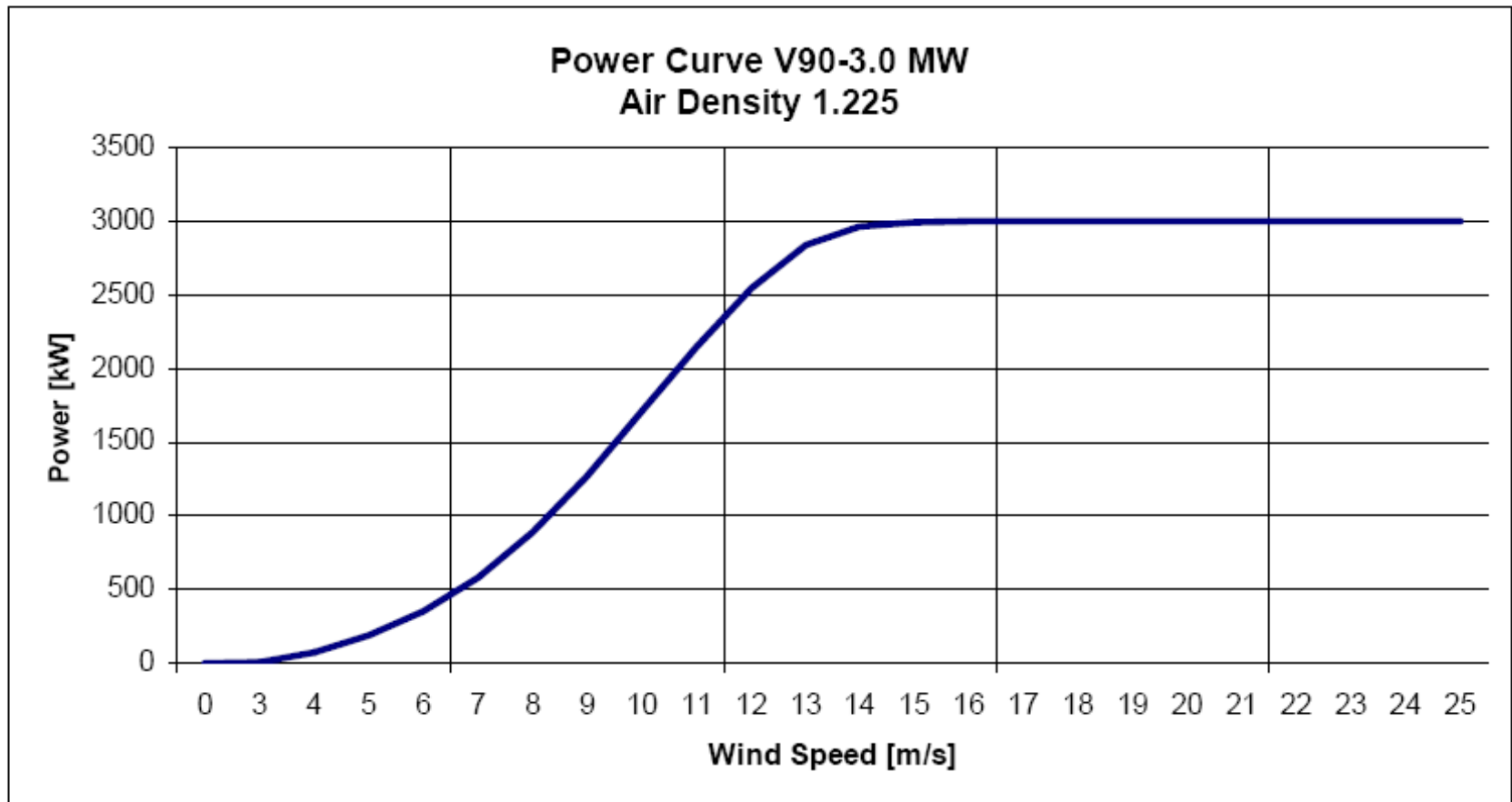


Fig. 2 Power curve for VESTAS V90 – 3.0 MW, 60 Hz 109.4 dB(A)



Completed Foundation

Flat Ridge Foundations

- **Base Diameter: 53'**
- **Pedestal Diameter: 18'**
- **Base Height: 5'-8"**
- **Pedestal Height: 4'-6"**
- **Base Concrete per WTG: 320 cu. Yds.**
- **Pedestal Concrete per WTG: 41.7 cu. Yds.**
- **Rebar per WTG: 63900 lbs.**
- **Concrete Strength: Base: 5000 psi; Pedestal: 5500 psi**
- **Grout Strength: 10,250 psi**
- **Anchor Bolts: Number, length: 128, 10'-9"**
Post tension: 112 KIP



Central Plains Wind Farm



Meridian Way Wind Farm



Vestas V90 Blades



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Central Plains Wind Farm



Completed Nacelle and Rotor



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PLUG in. **POWER** up. **CHARGE**

ahead with an electric vehicle and Westar Energy.



ElectroGo



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Hybrid Light Trucks



- Standard Hybrid
- MPG 21 City/22 Highway
- 6.0L V8, 332 hp
- Not available as plug-in yet
- ~\$8,400 premium
- Planned purchases
 - 2011 – 4
 - 2012 – 15
 - 2013 – 40
 - 2014 - 40



LOCATE A CHARGING STATION

Need a charge while you're out and about? Plan ahead or check in here while you're on the road. Updated often, this map will get you where you need to go to plug in, power up and charge ahead.

Enter a location or zip code, choose radius and find the nearest charging station.





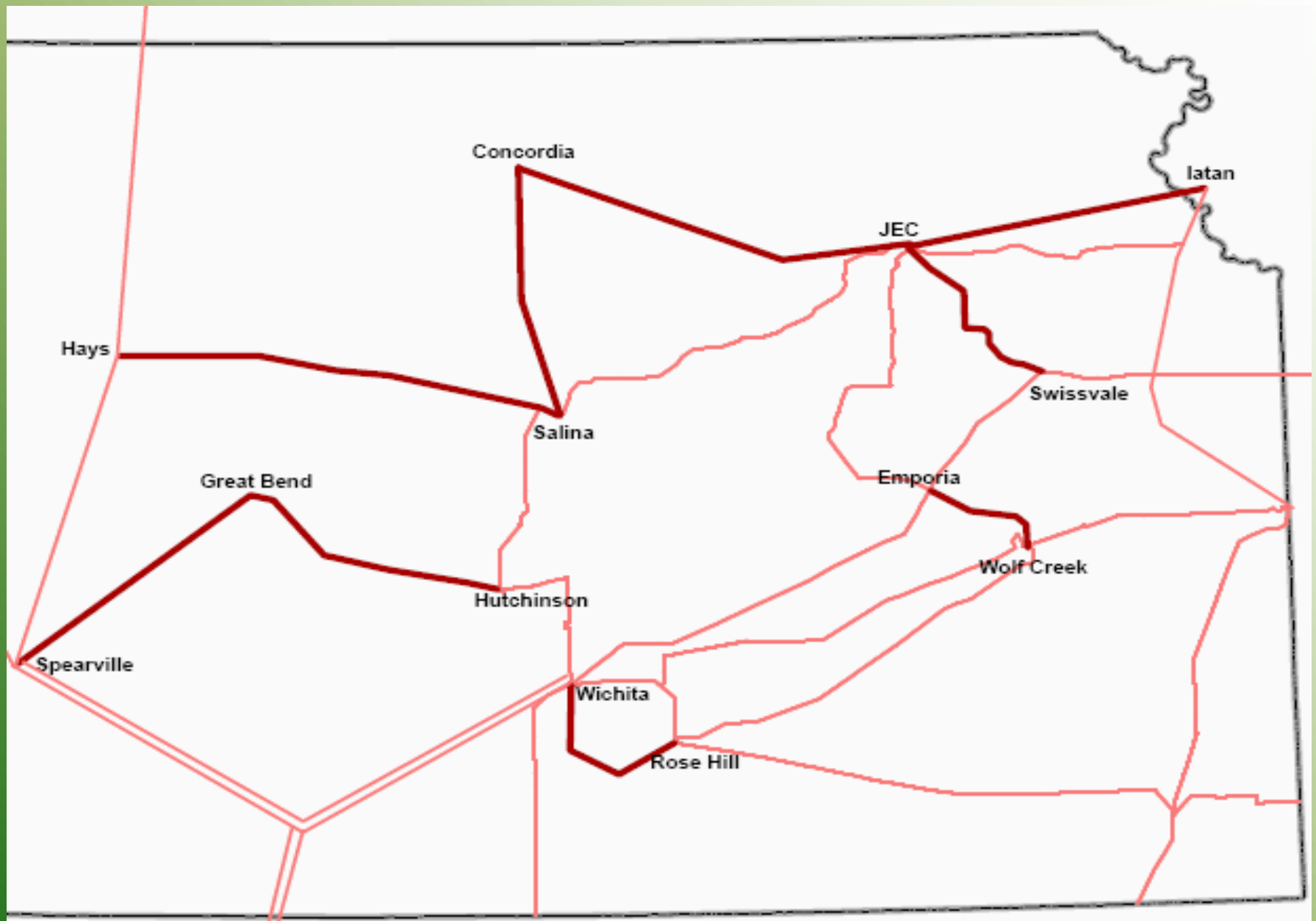
So green it hurts!

- Electric Smart Car
- 0-37 mph in 6.5 seconds
- 60 mph top speed
- 16.5 kwh Lithium –ion battery
- 82 mile range
- Only 250 being sent to US
- \$900+ monthly (48) lease...or give them the \$7,500 rebate and lease for \$600

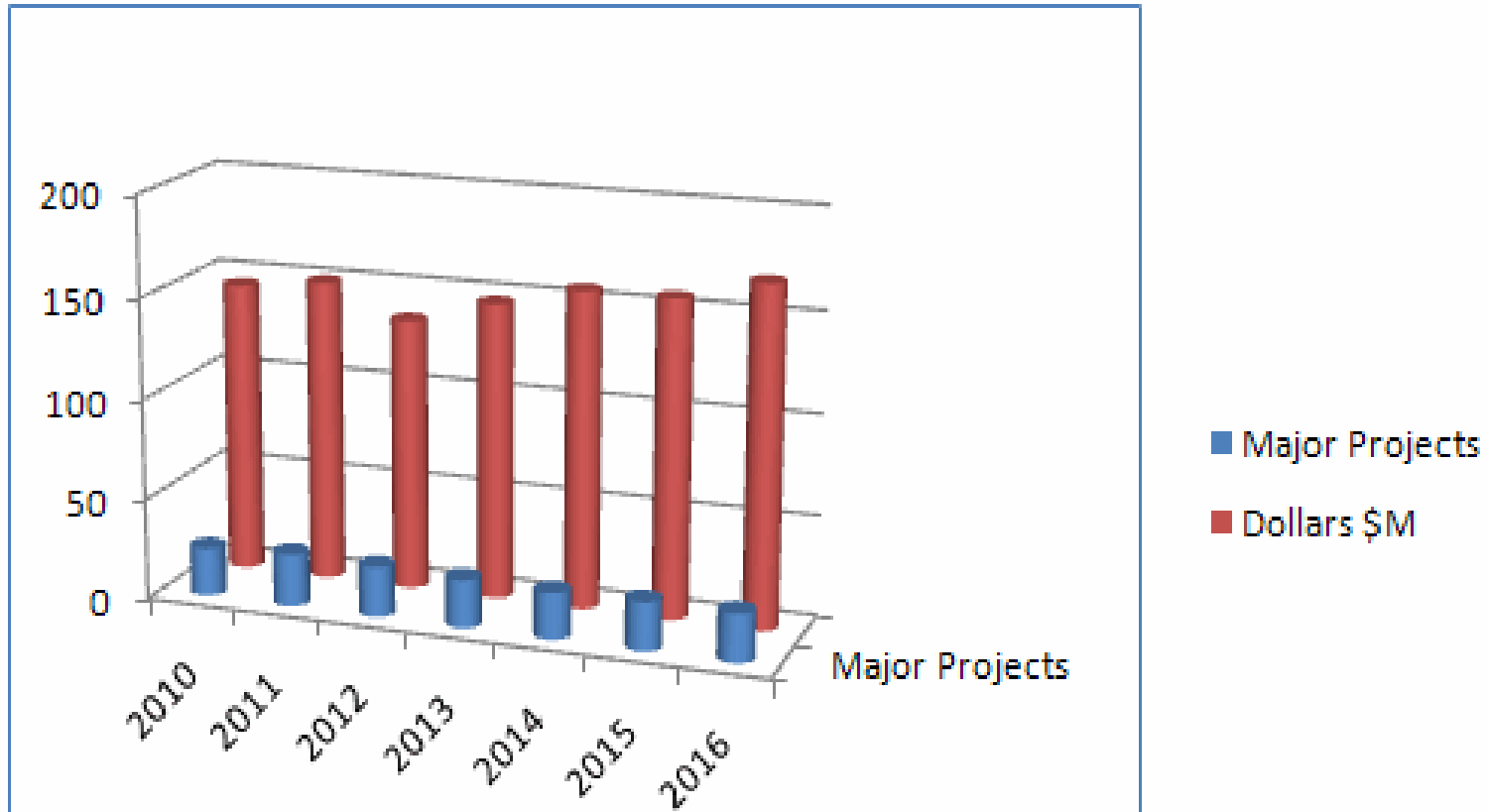




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Transmissions projects





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State & Federal Wetlands

Quivera Walkway



Restoring Native Prairie

Burnett's Mound Tree Clearing



Environmental Education for Youth

LeCompton Outdoor Classroom



Environmental Education for Research

Native Plant Research Garden at KU



Broader Environmental Education Symphony in the Flint Hills



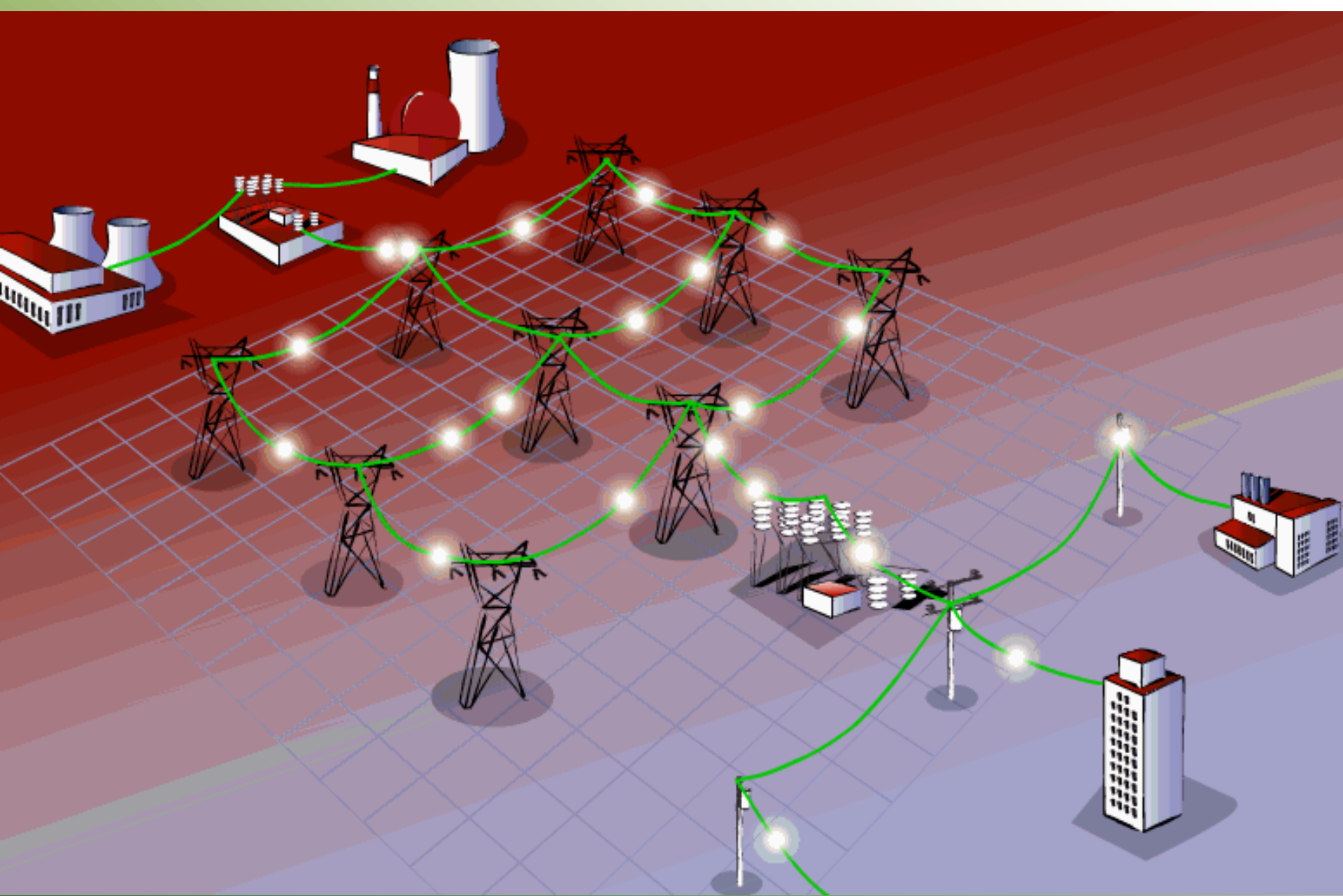
Protection of Sensitive Species

Least Tern Fencing at JEC



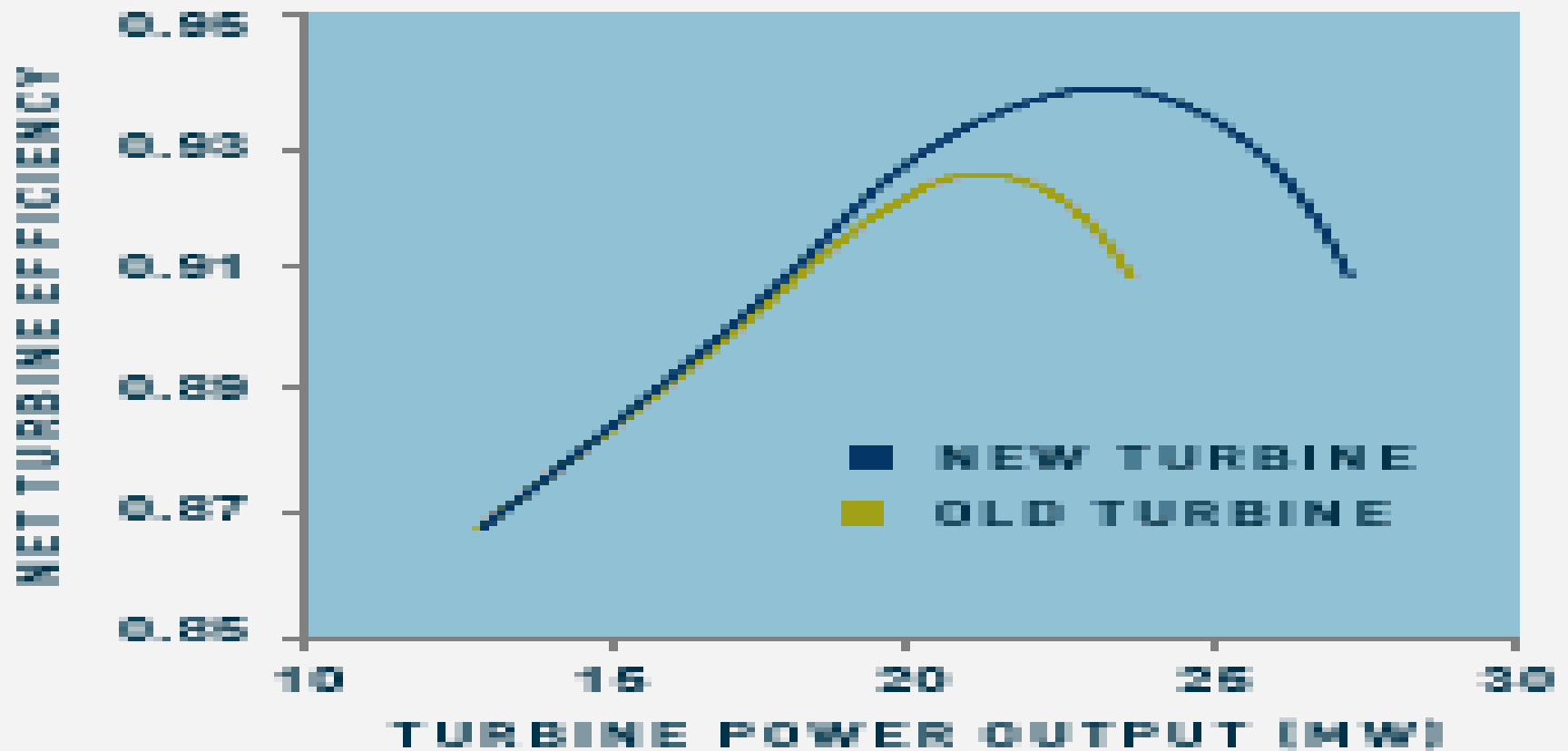


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TURBINE EFFICIENCY COMPARISON 1996 TO 1999



PEAK EFFICIENCY INCREASED FROM 82.7% TO 84.2%. PEAK OUTPUT INCREASED FROM 24MW TO 26.67MW



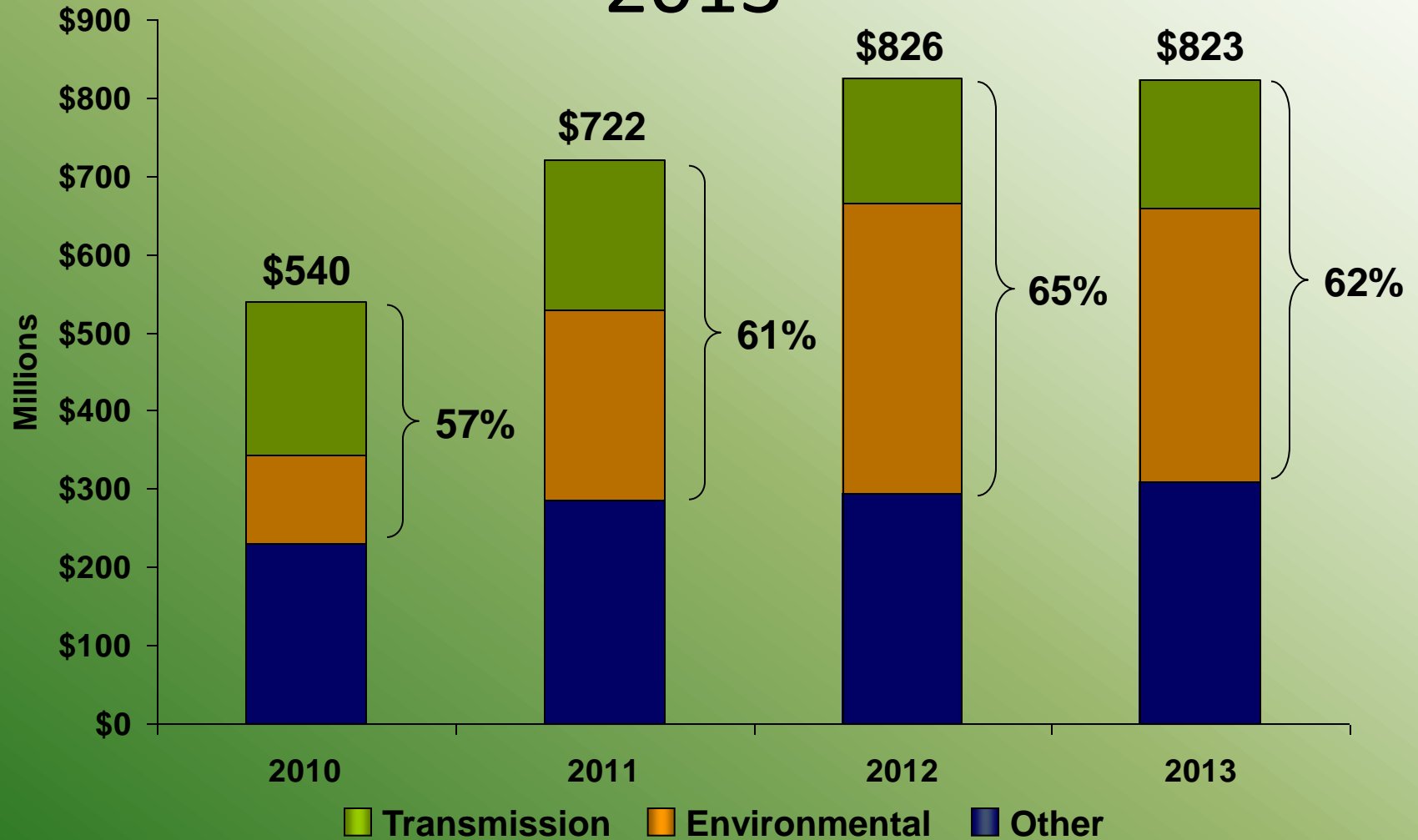


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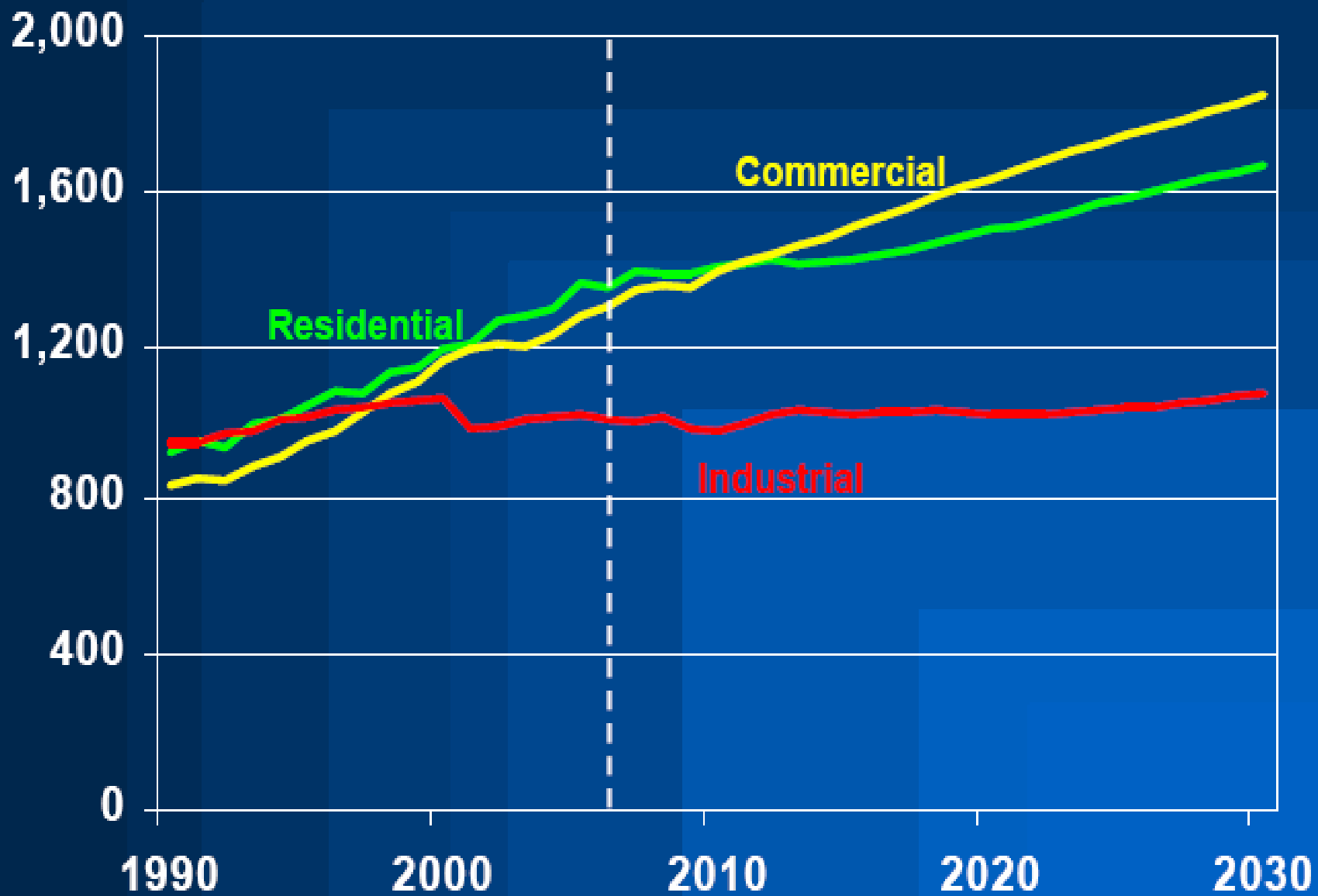
Major Construction Projects Underway

- Environmental (Air Quality)
 - Lawrence Energy Center
 - Fabric filters, rebuild scrubbers, precipitator, low NOx system
 - Jeffrey Energy Center
 - SCR on 1 unit
 - La Cygne Energy Center
 - Scrubbers, fabric filters, common chimney, SCR and low NOx system
- Transmission
 - Wichita to Oklahoma 345 kV
 - Planning and design Prairie Wind line (□ 100 mile double circuit 345 kV)
- SmartStar Lawrence
 - \$40 million project reduced by 50% DOE match
 - Advanced outage management
 - Automated metering infrastructure

Capital Expenditure Forecast 2011 - 2013



billion kilowatthours



The End

bill.eastman@westarenergy.com